Impact of ENSO-related Weather and Climate Conditions on Wheat Yield in Alabama

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Wheat Yield Differences by ENSO phase

For all the eight study locations, wheat yield was higher during La Niña and Neutral years. The higher differences between El Niño (low yield) and the other two phases were observed in North AL (SMS, TVS) and South AL (GCS). The smallest differences between ENSO phases was observed in Southeast AL (WGS). The smallest yield fluctuations were observed during La Niña years with special attention in North AL.

Materials and Methods:

1. Historic wheat yield records from Alabama Official Variety Trials (1982-2010) collected at eight research stations (Fig. 1) were used to identify yield differences by ENSO phase and test the interaction location × ENSO phase. Annual average wheat yield data was classified according to ENSO phase using the JMA index. Analysis of variance (ANOVA) was used to test wheat yield differences between ENSO Phases and interactions.

2. Historic weather data (1982-2010) collected at the eight research stations was used to study the differences between ENSO phases respect to Precipitation, and Maximum and Minimum Temperature. Those differences will be used to explain ENSO-related wheat yield differences. Canonical Discriminant Analysis was used to identify the weather and climate conditions, based on the Precipitation, and Maximum and Minimum Temperature variables, characterizing and differentiating each ENSO phase. This analysis will allow identification of ENSO climatic conditions favoring or reducing wheat yield at various locations in Alabama.

Objective: Establish the relation between ENSO-related weather and climate conditions and Wheat Yield in Alabama (AL).

Weather variables driving differences among ENSO Phases

Conclusions: Wheat-growing season weather and climate conditions are affected by ENSO resulting on yield differences. Lower wheat yields during El Niño years respect to La Niña years suggest either changes in management practices, use of wheat as cover crop not a cash crop, and/or different market strategies. The identification of precipitation and temperature differences between ENSO phases facilitate the establishment of adaptation strategies and understanding of wheat phenological changes associated with yield variability.